

RECENT DISSERTATIONS

SONJA M. MORK, 2006:

ICT in Science Education. Exploring the Digital Learning Materials at viten.no

Department of Teacher Education and School Development, University of Oslo, Norway

Abstract

The main topic of this thesis concerns how ICT in form of digital learning materials may serve as a vehicle guiding students and teachers in exploring socioscientific issues and scientific phenomena.

The thesis consists of four articles that focus on the following aspects of the use of ICT in science education: a) What characterises the digital learning materials from viten.no, and how do these influence learning? b) Students' argumentation when using information from viten.no in role-play debates, and the teacher role in such debates. The data material is based on studies in three 9th grade classes that used the Viten program *Wolves in Norway*, and four 10th grade classes that used the Viten program *Radioactivity*.

The results show that the students improved their knowledge after using both programs: they gave more nuanced descriptions of phenomena, used more scientific concepts and the answers were based more on facts than feelings. The first article shows that students, who before working on *Wolves in Norway* thought wolves are dangerous, changed their view to dangerous under specific circumstances on posttest. In article II, results show that students were very positive to *Radioactivity*, and thought it was fun to work on and had a good design. They thought *Radioactivity* provided variation and student control, and animations and visualisations made it easier to learn. There is a high degree of accordance between the animations in *Radioactivity* and guidelines found in the research literature: they are simple with no unnecessary text or features, they are designed as several steps where students can manoeuvre back and forth and they are related to important and "invisible" phenomena like the three radiation types. Features of animations are reflected in some student answers, both in the form of text and drawings. Articles III and IV deal with the closing activity in *Wolves in Norway*; a role-play debate. Article III introduces a new method for analysing student argumentation in debates. Student argumentation in this study varied from simple claims to more complex arguments with biological, personal, political and economic content. Article IV concentrates on the teacher role in the debate situation. A typology of potential problems in debates, including examples of how the teacher can handle these, is presented. This typology may serve as a tool for teachers who want to use debates in their teaching.

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Download: <http://folk.uio.no/sonjam/publications/publications.htm>

RECENT DISSERTATIONS

KAIJA SALMIO, 2004

Examples of national basic education evaluation programmes from the perspective of the didactics of sustainable development. National tests 1993-1995 and evaluation of learning outcomes in 1998.

Publications in Education No 98.
University of Joensuu, Finland

Abstract

This research surveys the national tests organized in Finnish basic education years 1993-1995 and in 1998 from the viewpoint of the didactics of sustainable development. The research evaluates the factors having affected the national tests, the implementation of the goals of the tests and the implementation of the goals for teaching in the national core curriculum.

The purpose of the Finnish national tests was to survey the control of the most essential parts of subjects, to develop school-specific curricula and the self-evaluation of schools as well as to support teachers' work. The purpose was as well as to examine the problems emerged in the national tests and to produce proposals for improvement.

At the beginning of the 1990's schools were given responsibility to make school-specific curricula. At the same time the Government expected follow-up of the evaluation reform, which includes the national tests of basic education organized by the National Board of Education. The administrative processes connected with the national tests are examined on the basis of written documents and by interviewing the persons having participated in the work.

The goals of the national tests were comprehensive and universal, but they conformed to the national core curriculum. Learning corresponding with the subject-specific content-based goals set both by the National Board of Education and the researchers for the national tests could be measured best, but learning or activity conforming to the other goals could hardly be measured at all. All evaluation methods used in the tests were not applicable to questions.

The national tests reflect the strong position of subjects, but at the same time show a narrow concept of curriculum, test and evaluation. The national tests are to support the curriculum and studying and in their contents it would be important to change over from subject-specific tasks to those requiring understanding, interactive and problem-solving skills as well as pupils' own activity. It would be important to change over from result-centricity to development. Evaluation is to focus on the future, not on the past. Decentralization of administration, globalisation and international co-operation unify the activities of schools, which can be seen for example in the use of international tests. Globalisation and the European Union bring influential people to the school and extend its tasks.

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Download: <http://www.joensuu.fi/library/> (English summary)

RECENT DISSERTATIONS

KALLE JUUTI, 2005

Towards Primary School Physics Teaching and Learning: Design Research Approach

Department of Applied Sciences of Education, University of Helsinki, Finland

Abstract

The thesis describes a project to design a primary school physics learning environment which takes into account teachers' needs, design procedures, properties of the learning environment, and pupil learning outcomes. The project's design team has wide experience in research and development work in relation to science education, the use of ICT in education, the way students think about physics, curriculum and teaching method development, and the design of instructional materials. This knowledge base was the starting point for design. The project engaged in design research. Design research is here considered to be a form of educational research, and offers opportunities to study unique educational phenomena. It produces artefacts to be applied directly in an educational setting, and thereby engages the researcher in the direct improvement of educational practice. Design research can even offer a strategy for the development and refinement of educational theory. The first main research result was a design procedure. The procedure contained four phases: 1) needs assessment; 2) definition of the objectives for a design solution; 3) design and production of the material; and 4) evaluation of the material. The phases apply research literature and empirical research. Phases three and four are iterative and include three stages: limited use of the prototype, a pilot test and a field test. The second main result was a designed learning environment as an example of a learning environment. The research showed that an environment should be: 1) concrete and illustrative, offering examples for the classroom; 2) mentally stimulating, for both study and practical work; 3) physically and pedagogically meaningful 4) usable; 5) offer peer and expert support for teachers. In addition, the research uncovered many contextual features that are important concerning the usability of the learning environment. The third main result was that qualitative level models delivered by way of stories offer much potential for learning primary school physics. From the Finnish perspective, the designed learning environment offers a novel phenomenon to investigate primary physics teaching and learning in a new situation where, from the point of view of this research, rather ambitious new National Framework Curriculum for physics education has been introduced.

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RECENT DISSERTATIONS

ROLF V. OLSEN, 2005:

Achievement tests from an item perspective: An exploration of single item data from the PISA and TIMSS studies, and how such data can inform us about students' knowledge and thinking in science

Department of Teacher Education and School Development, University of Oslo, Norway

Abstract

The thesis presents secondary analyses of data from a large-scale international assessment of students' achievement in mathematics, reading and science entitled the Programme for International Student Assessment (PISA) which is initiated and monitored by the OECD. The thesis has been conducted and supervised at the Department of Teacher Education and School Development at the Faculty of Education, University of Oslo.

The work presented in the dissertation is framed by two overarching questions relating specifically to the science achievement data in PISA: What is the nature of the information in the cognitive science items in PISA?, and; what is the analytical potential of this information? These two questions have been used as guides in several explorative analyses of the science achievement data in PISA presented in three published papers. The background for posing these general questions is the fact that when the achievement data are reported from these studies all the item specific information has been lost: Initially students' responses to each of the items have been marked by a number of specific codes capturing qualitative aspects of the responses. These codes are subsequently reduced or aggregated into credits or score points. Then the item scores are aggregated into one (or a few) reliable and valid overall achievement scores.

The first paper is primarily an introduction into this general background and a rationale is developed for why the study of the single items before they are aggregated is relevant and possible. The second paper uses homogeneity analysis in the study of the codes used in the initial marking before they are reduced to score points. The third paper studies the relative achievement profile across all items and across all participating countries by applying cluster analysis. The analysis demonstrates that countries are clustered and each cluster has a distinct profile across the items, and these profiles are not captured in the overall achievement scores.

One overall message in the thesis is that large-scale international comparative achievement studies do not only provide high-quality data of students' overall science achievement across the world. There is also a fine-structure in the data across the single items. It is envisaged that these data may also be used in secondary analyses targeting more specific research questions within the research field of science education across the world.

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RECENT DISSERTATIONS

CAMILLA SCHREINER, 2006:

Exploring a ROSE-garden: Norwegian youth's orientations towards science – seen as signs of late modern identities

Department of Teacher Education and School Development, University of Oslo, Norway

Abstract

The thesis is based on the view that science teaching must build on an understanding of the students' culture, priorities and concerns.

The empirical material is collected through the ROSE project. ROSE (The Relevance of Science Education) is a comparative project meant to shed light on affective factors of importance to the learning of science and technology. The target population is students towards the end of lower secondary school (age 15). The research instrument was developed in cooperation with an international group of science educators. The resulting instrument was a questionnaire, mostly consisting of closed questions addressing the students' interests, attitudes, plans, views on the environmental challenges, etc. This thesis uses data from more than 26 000 students in 25 countries in Europe, Africa, Asia and South America.

The research aims were to develop a student typology based on the Norwegian data, to characterise the student types' orientations towards science, and to study Norwegian youth's interests against a background of students from less modernised countries. The results are discussed in the light of sociological theories on youth in late modern societies, especially by drawing on perspectives on the late modern project of identity construction.

The data analysis applies multivariate methods, and has an explorative and data-driven approach: The next step of the analysis has been successively adjusted according to the results from the previous step.

The results can be summarised under three main conclusions:

- Norwegian students can be divided into five student types with distinct orientations towards science.
- Students' interests in science are sex-specific.
- There are characteristic cross-national patterns in youth's interests that follow a modern-traditional divide.

The underlying purpose of the research is to promote a science education that aims to empower students to make a better world, and make students see themselves as actors, not onlookers. The last section discusses how sociological perspectives on modern youth can inform the area of science education and how science teachers can use the youth culture as a teaching resource for making the students more actively engaged.

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